BUTTERFLIES OF BANGLADESH

A broad approach for nature lovers

First Edition

Volume 1: Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae

By

Dr. M.A. BASHAR

B.Sc. (Honours), M.Sc. (Dhaka)
Dip.-in- Apiculture (Sassari, Italy)
D.Sc. (Pau, France)

Professor
Department of Zoology (EBBL), University of Dhaka
Founder: First Open Butterfly Research Park
Dean, Faculty of Biological Sciences, University of Dhaka (2002); (2008-2010)
Pro-Vice Chancellor, Bangladesh Open University, Gazipur, Dhaka (2002-2006)
Author: ***Instant Basics of Environment*** (First Edition, 2004)
Dictionary of Biodiversity (First Edition, 2013)

Environmental Biology and Biodiversity Laboratory (EBBL)
Department of Zoology, University of Dhaka,
Dhaka-1000, Bangladesh

To my father and mother

The
sense of
biomagnification
in the biosphere-realization
species extinction and creation
life-chain of rotation and connection
are nature's greatest plays of glorification,
all are balanced in ecobio-natural classification
evidenced and expressed with much beautification
these are ever maintained by biological justification.
All these are in a process of long long eternal sensation,
when nature's play is never affected by human intervention

-- M. A. BASHAR

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By Prof. Dr. M. A. Bashar

Volume 1

Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae

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Editor's Note

The book "Butterflies of Bangladesh" is written based on the works of Dr. M.A. Bashar and his research team. In the book, they incorporated the information on the butterflies of Sylhet, Chittagong, Modhupur regions, Bhawal National Park of Gazipur district and many other different forests of Bangladesh including the Sundarban mangrove forests. Under the leadership of Professor Bashar, the researchers collected the butterflies of the regions, and nicely and scientifically they have preserved them in the EBBL laboratory of the Department of Zoology, University of Dhaka. The taxonomy, ethology and ecology of the butterflies are described in the book.

The book will help the readers in identifying the butterflies up to species level by following an easy identification procedure that is clearly understood and followed. Various activities, mainly ecological and ethological, of the butterflies are well illustrated in the book which, I am sure, will inspire the readers in *butterfly watching* like birds watching. In the book, five butterfly families, e.g. Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae are described with illustrations. The butterflies of the family Satyridae are properly identified and illustrated in the chapter 13 without their detail description.

Dr. Bashar, besides showing how easily butterflies can be identified by using the wing venation and other morphological characters, shows the relationships of the butterflies with the three types of plant species (e.g. host, nectar and resting) they prefer for sustaining their life in nature; he also shows their behavioural activities in egg-laying, foraging, puddling, basking, resting, territoriality etc. that are nicely presented photographically.

If anyone intends to observe butterflies alive in nature in open environment and if anyone is interested in butterfly behaviour, this book will certainly be worth reading. It is noted that Dr. Bashar is the founder of the first Open Butterfly Research Park situated at the Bhawal National Park in Gazipur district which is about 40 kilometers off Dhaka city. As far as it is known to us that the Open Butterfly Park is the first of its kind in the country and perhaps in the world. The park is certainly to be a site of butterfly watching for amateurs and also for academics and researchers.

Professor Humayun Reza Khan
Department of Zoology
University of Dhaka, Dhaka
&
Chief Editor
Bangladesh Journal of Zoology
Zoological Society of Bangladesh (ZSB)
Dhaka, Bangladesh

Preface

This book is intended as a general taxonomy book for butterflies of Bangladesh with a view to advance towards biodiversity conservation and nature conservation. It is meant for researchers, undergraduate and graduate students, and for nature lovers who are interested of environment, ecotourism industry, biodiversity conservation, climate change impacts and bio-resource managements.

Bangladesh is rich in biodiversity of both flora and fauna. But only two species of birdwing butterflies (*Troides* spp.) are available in our forest areas. The *Troides* species are in the CITES list. Bangladesh needs to protect them at least in the forest areas for an indicator of forest's health status. I was impressed by the birdwings while collecting butterflies in the forests of Fashiakhali in 1988 for the first time. I started to examine butterfly behaviours in the forests and collect them for scientific study. At that time I was accompanied by some research fellows and graduate students to carry out the research activities in the field of biodiversity. They were Dr. Mamun, Mr. Sajjad, Mizanur Rahman, Kaushik Kumar Mondal, Mr. Mahbubur Rahman, Sajeda Akand, Shahnaz Begum, Shahana Bilkis and Shamsun Nahar. They were the first group of researchers. In the second phase of the work, more researchers joined in my programme. They A. K. Chowdhury, Al-Mamun, Hasina Arju, M. A. Rimad, F. N. Chowdhury, S. I. Belal, Nousheen Parvin, Shahanaz Rahman, Sajeda Akand, A. F. Aslam, Maksudul Alam, G. Maula, T. J. Khan, F. E. Jahan, Y. Chowdhury, Khalilur Rahman, Brojeshwar, Kauser Mian, Rajib Hasan, Sumi Akhtar, Dilruba Akhter, Shukla Debnath, Shafiqur Alam, Krishna Karmaker, M. Sayem, Tariqul Islam, Laukhia and Aminul Islam. Of the above fellows, Dr. Al-Mamun, Dr. Hasina Arju, Dr. F. N. Chowdhury, S. I. Belal, Shahanaz Rahman, Sajeda Akand and M. A. Rimad have completed their higher degrees such as Ph. D. and M. Phil. The rest of them are in the study programme for higher degrees in the Department of Zoology under the butterfly programme and in the field of bio-resource management. For delving into the depth of the subject biodiversity conservation, I created a small laboratory in the department of Zoology, University of Dhaka which was named "Environmental Biology and Biodiversity Laboratory (EBBL)" in 1990. The researchers who have been awarded Ph. D. and M. Phil degrees are associated with the research activities of the EBBL.

My intention in each chapter of this book has been to develop a practical idea as far as butterfly ecology, habitat and interactive activities with the related plants are concerned. The potential for rapid evolution and co-adaptation between butterflies and their related plants is well known, but its use as a tool for considering it as a biotic indicator has not yet tested well. Before going to test the hypothesis scientifically it is essential to ascertain how far the butterflies are interactive at the molecular as well as the community levels in an ecosystem, especially in the forest ecosystem. The model has been presented in the text for further studies in the subject.

EBBL has undertaken a grand programme to study of biodiversity and conserve biodiversity in the Bangladeshi perspective. Butterflies have been identified in this case as key biotic factors for use in assessment of forest soundness and its rate of depletion, which is done by assessing the depletion of butterfly fauna in a target forest ecosystem. EBBL has already given a research proposal under the heading "Birdwing butterflies conservation in Satchari and Rema-Kalenga forests in Bangladesh". To materialize the envisaged research programme will first need a preliminary research. Results of such preliminary researches have been compiled in the book.

The book is divided into twelve chapters. **Chapter 1** is introductory, which focuses on butterflies along with their fundamental traits. The chapter also discusses Environmental Biology and Biodiversity Laboratory (EBBL), the past and present programmes as well as butterfly-plant relationships, role of butterfly's in the forest ecosystem, butterfly colonization

and butterfly park, role of butterfly as 'biotic indicator' in the question of climate change impact on the biodiversity. The role of butterfly-plant association in biodiversity conservation and nature conservation has also been briefly mentioned in the chapter. **Chapter 2** deals with butterfly as a whole. The chapter clarifies stages of life cycle of the butterflies. In addition, the chapter attempts to describe scales and colouration in butterflies. Variation of colouration in the butterflies and mimicry in butterflies are also discussed in the chapter. Butterfly habits and maintenance of different stages of life cycles are also entertained. **Chapter 3** contains scenarios regarding Bangladesh and butterflies. These include forest areas, study areas and experimental stations. **Chapter 4** shows illustration of life cycle of butterflies. It contains life cycle of ten butterflies in total from different families. **Chapter 5** contains ideas about butterfly identification and butterfly families. In this chapter, a general description points out the significance of various organs and the butterfly characteristics in different families available in Bangladesh. In this book, identification and description of only five families (Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae) have been considered. **Chapter 6** deals with the tabular 'morph' of the species, genus and subfamilies of the family Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae. **Chapter 7** describes the butterfly-organs which have been used as identifying characters. In this chapter, key characteristics of the butterfly families have been illustrated with figures and plates. The **Chapters 8, 9, 10, 11** and **12** deal with the family Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae respectively. In these chapters identification up to species level with illustration for each of the families has been made by preparing a key chart. Description of the species behaviour, eco-biotic information and general information on each of the species has been included in the respective chapters for the selected five families (Papilionidae, Nymphalidae, Pieridae, Danaidae and Lycaenidae). The book ends with "Family-wise identified butterflies with their respective plate number" in the **Chapter 13**. It is to be noted that, it is for the first time that a book on the basis of research-results has been published in the country. Any ideas, suggestions, additions, modifications, and constructive criticism to improve the context of the book will be gratefully acknowledged.

Professor BASHAR and scientists of the EBBL in the field demonstration (Satchari: 2 June, 2009).

--M. A. BASHAR

Author's Acknowledgements

Many of the concepts treated in this book were taught to me by Professor V. Labeyrie, Professor Emeritus, University of Pau, France. My ecological thinking related to the plant-insect association and interaction has been shaped by his approach to ecology. I am grateful to him for inspiring me and for providing me the basis of thinking in the line. I have benefited during the preparation of this book from the advice of colleagues who read drafts of the chapters. They provided many helpful suggestions. I am indebted to Professor H. R. Khan (Entomologist), Department of Zoology, University of Dhaka; Professor A. J. Hawlader (Entomologist), Dean, Faculty of Biological Sciences, Jahangir Nagar University, Dhaka; Professor R. M. Shahjahan (Genetician: Entomologist), Department of Zoology, University of Dhaka; Professor M. Nasiruddin (Entomologists), University of Chittagong; Professor S. H. Mondal (Entomologist), Institute of Biological Sciences, University of Rajshahi; and Dr. Tanzin Akhter (Entomologist), Department of Zoology, University of Dhaka. They read the drafts and made useful corrections, modifications, additions and constructive criticism. This book has come to the present state because of efforts given by several of my students, especially Dr. A. Al-Mamun, Mr. Sajjad, Mizanur Rahman, Kaushik Kumar Mondal, Mr. Mahbubur Rahman, Sajeda Akand, Shahnaz Begum, Shahana Bilkis and Shamsun Nahar. They were the first phase researchers. In the second phase of the work, more researchers joined in my programme named A. K. Chowdhury, Al-Mamun, Hasina Arju, M. A. Rimad, F. N. Chowdhury, S. I. Belal, Nousheen Parvin, Shahanaz Rahman, Sajeda Akand, A. F. Aslam, Maksudul Alam, G. Maula, T. J. Khan, F. E. Jahan, Y. Chowdhury, Khalilur Rahman, Brojeshwar, Kauser Mian, Rajib Hasan, Sumi Akhtar, Dilruba Akhter, Shukla Debnath, Shafiqur Alam, Krishna Karmaker, M. Sayem, Tariqul Islam, Laukhia and Aminul Islam. I acknowledge their contribution to the research part and also in preparation of the text.

Professor BASHAR and some of his research associates in the germplasm centre of butterfly colonization (Curzon Hall Campus, University of Dhaka).

I started to collect butterflies since 1988. I have built up my laboratory collection stretching over the last 24 years. This book took more than fifteen years to complete, withstanding several constraints and hurdles. But it came to this stage finally because of my research associates and graduate students (Ph. D. and M. Phil fellows) of my laboratory, the EBBL. It was possible for their direct help, cooperation and encouragement. They also helped me overcome many problems and logistic constraints. The book has used some scientists, knowhow and the result of their hard labour both in laboratory and in the fields. This created a situation to carry out the research and at the same time make the book press ready. Dr. A. Al-Mamun, a pioneer is one of them in the country research in butterfly and butterfly biodiversity. He completed his Ph. D. in butterfly conservation and distribution in Bangladesh forests. He helped me a lot in stretching, preserving, indentifying and finally in population studies. He is the first scientist in Bangladesh who made a thorough research in butterflies. I am grateful to him for providing me materials regarding text preparation. Dr. Hasina Arju is an expert in the field of pierid butterflies in Bangladesh. She did her higher studies (Ph. D.) in pierid butterflies biology and their relations with host plants. She carried out some research in the field of butterfly-role in biodiversity conservation. Her contribution in the preparation of the text is highly commendable. I acknowledge her contribution with pleasure and satisfaction. My graduate student Shahanaz Rahman (Ph. D. fellow in the EBBL) who completed her M. Phil degree very recently in the field of satyrid butterflies in a remote forest of Bangladesh. She gave me valuable assistance in the preparation of the text. She has developed some innovative techniques for studying wing venation in butterflies which is known as EBBL-technique of venation study. With hard labour and patience, she carried out most of the work in preparing the press ready copy of the text. She arranged the plates and figures systematically in the text. I am ever grateful for what she has done for the book. Sajeda Akand is an Assistant Professor of Zoology and Ph. D. fellow in the EBBL, she has completed her M. Phil in the field of lycaenid butterflies and their related plants. She prepared the part of lycaenid butterflies in the text. She has done very keen work in the text and made tabular formation of all families presented in the text with their identified genus and species under the respective subfamilies. Her effort in the text preparation is gratefully acknowledged. In the preparation of the text and in carrying out practical works both in laboratory and in the fields, scientists M. A. Rimad, Golam Maula, Maksudul Alam and Lutfor Rahman gave endless efforts to bring the text in the present stage. Their knowhow, capability, hard labour and great patience given to the research based text are praiseworthy and deeply acknowledged. They have made it possible to set up an ‘Open Butterfly Research Park’ in Bangladesh. Mr. Rimad prepared the front and back page arrangements with Bangladesh butterflies in active forms. I am especially grateful to him for arranging the front and back pages scenarios. Mr. Kauser Mian (MS research fellow) has helped in preparing the text of forests in Bangladesh with their location and importance in respect of butterfly population. I acknowledge his effort in the text. Drawing of butterfly-scales according to family characteristics and systematic synthesis was done by Laukhia, M. Phil fellow of the EBBL. It is a marvelous work performed by her and I am grateful to her for providing such sophisticated performance in the text preparation. All other scientists who have completed their higher researches in the EBBL laboratory in the fields of butterflies and bio-resource managements have extended their hands in preparing a good morphic structure of the text both in scientific and informative enrichments. They are Dr. F. N. chowdhury, Mrs. Imrana Belal and Mr. Ashek Kabir Chowdhury. Ph.D. fellow Mr. Tariqul Islam and M.S. student Aminul Isalm gave significant attention in the preparation of the text. I acknowledge their attentive efforts in the line with great satisfaction.

Professor Syed Manzoorul Islam, the renowned Professor, Department of English, University of Dhaka has encouraged me to write the book. He expressed great satisfaction and pleasure after he read the manuscript. His encouragement and continuous support to prepare the text is highly acknowledged.

Dr. M. Firoj Jaman, Associate Professor, Department of Zoology, University of Dhaka has shown keen interest in the text to publish for future researchers in the line. He has gone through the text and made some fruitful suggestions to improve the contents of the book. His suggestions encouraged me to publish the book. I am grateful to him.

At the beginning of butterfly research programme, from time to time, the Ministry of Science and Technology, Government of Bangladesh provided us with partial financial support. I am grateful to the Ministry and acknowledge such cooperation. The Ministry of Education at present is supporting us with partial financial support on the butterfly colonization research project. The EBBL members are grateful to the Ministry in this respect. The Department of Forestry, Ministry of Environment and Forest has extended cooperation in conducting butterfly researches in the field conditions and in the forests. The Department of Forest has allocated 10 acres of land in Bhawal National Park area for establishing an "Open Butterfly Research Park" and doing higher researches in the line. I cordially acknowledge their cooperation in the field. The Pubali Bank Authority has given official consent to provide us with some financial support to continue research in the field of butterfly conservation and nature conservation. By this time the Bank has allocated a token support to the programme. I am highly obliged and grateful to the interest that the Bank has shown in the field of higher researches and acknowledge its intention to help. I sincerely acknowledge the help of the MD of the bank Mr. Helal Ahmed Chowdhury.

Helpful cooperation received from my family members especially the encouragement comes from my youngest son Mr. Erfan Bashar is enthusiastic. I acknowledge their cooperation. Mr. Kamolesh Dhar extended his expertise in computer composition of the entire text with patience and time. I am grateful to him and acknowledge his efforts given in the text.

--M. A. BASHAR

Contents

Note: D= Dorsal side of the butterfly specimen examined
V= Ventral side of the butterfly specimen examined